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REMARKS

Following entry of the present amendment, claims 1-10 and 12-23 remain in the application for consideration. Claims 1, 2, 9, 13, 14, 19, 20, 21, and 22 are herein amended. Claims 11, and 24-41 are herein cancelled without prejudice.

Restriction/Election:

In the Restriction Requirement mailed July 16, 2002, Applicants elected with traverse to prosecute the claims of Group I, claims 1-23, directed to a coated substrate, and such claims are currently pending in the present application. The claims of Group II, claims 24-41, are herein cancelled without prejudice, and subject to Applicants right to file divisional applications on the non-elected claims pursuant to 35 USC §121 and claiming priority to this application under 35 USC §120.

The Invention:

The present invention is directed to coated substrate that includes an antitarnish component. In one embodiment, the invention is directed to a coated substrate, comprising an antitarnish layer deposited on a substrate, and an outer layer comprising tin or tin alloy deposited onto the antitarnish layer, as disclosed and particularly claimed in claims 1-12. According to the invention, the antitarnish layer positioned

between the substrate and the outer layer results in significantly reduced tarnishing of the outer layer.

In a second embodiment, the present invention is directed to a substrate coated with a metal layer, wherein the metal layer includes a nonzero concentration gradient of antitarnish agent whereby the greatest concentration of antitarnish agent is located adjacent to the substrate and the least amount of antitarnish agent is located at the top of the metal layer, as disclosed and claimed in claims 13-23. In this embodiment, a heating step (termed "reflow") is performed on the coated substrate in order to melt the outer layer and allow it to diffuse into the antitarnish layer, thus establishing a concentration gradient of antitarnish agent diffused through the outer layer.

Rejections under 35 USC §112, First Paragraph:

Claims 1-12 were rejected under 35 USC §112, first paragraph, as allegedly not containing subject matter which was described in the specification in such a way as to enable one skilled in the art to make and use the invention. In particular, the Examiner indicates that the Applicants have not taught how one of ordinary skill in the art can confer antitarnish properties to the outer surface of the claimed

laminate absence a heat treating step. Applicants respectfully traverse the rejection.

Applicants submit that claim 1 is directed to a coated substrate, comprising an antitarnish layer deposited on a substrate; and an outer layer deposited onto the antitarnish layer, the outer layer comprising tin or tin alloys having at least 50% by weight tin, and wherein the antitarnish layer is present in an amount effective to prevent tarnishing of the outer layer.

As disclosed in the specification beginning at page 8, line 11, and continuing to page 15, line 22, Applicants describe in detail how to make and use this embodiment of the invention. In particular, Applicants describe the steps of preparing the substrate, applying the antitarnish coating to the substrate, and applying the tin coating to the antitarnish coating. Optional steps, such as producing a matte-type finish, or adding a friction reducing material. Noteably, no heating or "reflow" step is necessary for this embodiment of the invention. Further, regarding this particular embodiment, the specification specifically states at page 15, lines 20-22:

> At this point, the substrate is now coated with the coating and may be utilized. Alternatively, the coated substrate may be further processed as follows.

Thus, Applicants submit that the embodiments claimed in claims 1-12 stand on their own and a reference or limitation to heat treatment is not necessary. Accordingly, Applicants submit that this rejection is untenable and should be withdrawn.

Claims 1-12 were further rejected under 35 USC §112, first paragraph, as being non-enabling for any substrate. While the Office Action indicates that the specification is enabling for substrates that are heat tolerant and diffusion resistant as compared to the outer tin layer, the Office Action further indicates that the specification allegedly does not support the breadth of any substrate. Applicants respectfully traverse the rejection.

As indicated above, claims 1-12 do not require a heat treatment step. Moreover, Applicants describe a variety of substrates that are useful in the present invention at page 8, lines 11-17 (e.g., metal, plastic, composites and the like). Applicants submit that one of skill in the art would be able to choose a suitable substrate given the teachings in the application in combination with what is well-known in the art. Accordingly, Applicants submit that this rejection is untenable and should be withdrawn.

Rejections under 35 USC §112, Second Paragraph:

Claims 1-23 were rejected as being indefinite for various reasons. In particular, claims 1-12 were rejected because the phrase "antitarnish layer" is allegedly unclear. The Examiner indicated that "a layer merely underneath the outer layer cannot prevent tarnishing of the coated substrate".

Applicants submit that detailed description of the invention, at page 7, lines 1-7 recites:

> It has been surprisingly found, in accordance with the present invention, that oxidation and discoloration of tin base coatings or tin alloy coatings may be significantly reduced or completely eliminated by application of an antitarnish undercoating layer positioned between the tin base coating and the substrate.

Thus, the invention is directed to, among other things, an antitarnish coating positioned between the tin coating and the substrate, as shown in Fig. 1. As indicated in the application, this positioning of the antitarnish layer significantly reduces or eliminates tarnishing of the outer tin layer.

Applicants herein amend claim 1 to more precisely recite the claimed invention, and to clarify that the outer layer is protected from tarnish by virtue of the antitarnish layer positioned between it and the substrate. No new matter is added by these amendments, and Applicants submit that this rejection is overcome.

Claims 13-23 were rejected because the phrase "concentration gradient" was allegedly unclear, particularly in view of the phrase "highest concentration of said antitarnish agent". Applicants herein amend claim 13 to recite a nonzero concentration gradient in order to clarify that the scope of this claim does not include coatings that possess uniform distributions. Consequently, Applicants submit that the scope of claims 13-23 are directed to, among other things, a nonzero concentration gradient of antitarnish agent that has diffused into the metal layer. Applicants therefore submit that this rejection is overcome.

The Examiner indicated that in claim 11, the antecedent basis for the phrase "said coating" was unclear. Applicants herein cancel claim 11, and now submit that this rejection is moot.

The Examiner indicated that with reference to claims 2, 9, 14, and 20, it is unclear what distinguishes a combination from an alloy. Applicants herein amend claims 2, 9, 14, and 20 to delete the "alloy" language and now submit that this rejection is overcome.

With reference to claims 14 and 19, the Examiner indicated that the antecedent basis for "antitarnish layer" is unclear. Applicants herein amend claims 14 and 19 to delete this language, and now submit that this rejection is overcome.

With reference to claim 21, the Examiner indicated that the phrase "said outer layer" lacked antecedent basis. Applicants herein amend claim 21 to properly recite "coating" to provide proper antecedent basis. Applicants now submit that this rejection is overcome.

The Examiner indicated that with respect to claim 22, the phrase "heat treated condition" is unclear. Applicants herein amend claim 22 to delete the reference to a heat treated condition and now submit that this rejection is overcome.

Rejections under 35 USC §102:

Claims 1, 3-7, 13, and 15-18 were rejected under 35 USC §102(b) as being anticipated by Japanese Patent Publication No. 09-291394 issued to Yoshiaki et al. Applicants respectfully traverse the rejection.

Yoshiaki et al. disclose an aluminum base material coated with tin or a tin alloy, wherein a concentration gradient of tin or tin alloy such that the concentration of tin is least towards the direction of the base material.

In contrast, claim 1 of the present invention recites a coated substrate, comprising an antitarnish layer deposited on a substrate; and an outer layer deposited onto said antitarnish layer, said outer layer comprising tin or tin alloys having at least 50% by weight tin, and wherein said antitarnish layer is

present in an amount effective to prevent tarnishing of said outer layer.

Claim 13 of the present invention further recites a coated substrate comprising a coating on a substrate, said coating having a first surface and a second surface, said second surface positioned adjacent to said substrate, and comprising a metal layer comprising tin or tin alloys having at least 50% by weight tin; and a nonzero concentration gradient of antitarnish agent diffused into said metal layer, said nonzero concentration gradient having the highest concentration of said antitarnish agent at said second surface, said antitarnish agent present in said coating in an amount effective to prevent tarnishing of said metal layer; and wherein said coating has a thickness between 10 microinches and 1000 microinches.

Applicants submit that Yoshiaki et al. does not anticipate the presently claimed invention. Yoshiaki et al. does not disclose an antitarnish layer positioned between the substrate and the tin layer (e.g., three materials). On the contrary, Yoshiaki et al. discloses only two materials in the disclosed laminate. Further, with respect to the concentration gradients, Yoshiaki et al. discloses that the least amount of tin is present at the interface of the base aluminum material. In sharp contrast, the present invention claims the greatest amount of antitarnish agent at the substrate interface. Based on these

distinctions, Applicants submit that Yoshiaki et al. does not anticipate the presently claimed invention, and that this rejection is overcome.

Claims 13-15, 21, and 23 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 5,028,492 to Guenin. Applicants respectfully traverse the rejection.

Guenin discloses a composite coating composition for electrical connectors made from a ductile metal and a polymer. Ductile metals include tin, lead, and alloys of tin and lead, indium, and silver. The polymer component includes polyimide, polyamide, and PTFE, and such polymers are uniformly dispersed throughout the metal matrix.

Applicants submit that Guenin does not anticipate the present invention. Guenin does not disclose or suggest a nonzero concentration gradient of antitarnish agent diffused into a metal layer, or that any concentration gradient has the highest concentration of antitarnish agent at said second surface, as particularly recited in claim 13. On the contrary, Guenin discloses a composition that is a uniform distribution of ductile metal and polymer.

Applicants submit that claim 13 now recites a nonzero concentration gradient to distinguish the present invention from the cited reference. In addition, the recitation in claim 13 to "highest concentration of antitarnish agent at said second

surface" further distinguishes the invention from the disclosure of Guenin that possesses a uniform distribution of materials (e.g., concentration gradient of zero). Accordingly, Applicants submit that the present invention is not anticipated by Guenin and that this rejection is overcome.

Claims 1, 2, 6, 7, 12, 13, 14, 15, and 23 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 5,759,379 to Cavallotti et al. Applicants respectfully traverse the rejection.

Cavallotti et al. disclose a soldering method for soldering electronic components onto a copper substrate using a tin alloy. The method involves pretreating the copper substrate with a layer of zinc before the deposition of the tin layer, and greatly enhances the mechanical and electrical properties of the solder alloys.

Applicants submit that Cavallotti et al. does not disclose or suggest the presently claimed invention. Cavallotti et al. does not disclose or suggest that the zinc coating may be used as an antitarnish layer, much less the advantages of having an antitarnish layer applied to the substrate. Cavallotti et al. also do not disclose or suggest that the proper amount of zinc is an amount effective to prevent tarnishing of the outer layer. Accordingly, Applicants submit that the claimed invention is

distinguishable from Cavallotti et al., and that this rejection is overcome.

Claims 1-3, 6, 7, 12, 13-18, and 23 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,403,234 to Kodama et al. Applicants respectfully traverse the rejection.

Kodama et al. disclose a substrate coated with an intermediate layer of phosphorous, boron, zinc, and copper, and a tin or tin alloy top coating.

Applicants submit that like Cavallotti et al., Kodama et al. does not disclose or suggest the presently claimed invention. Kodama et al. does not disclose or suggest that the zinc coating may be used as an antitarnish layer, much less the advantages of having an antitarnish layer applied to the substrate. Kodama et al. also do not disclose or suggest that the proper amount of zinc is an amount effective to prevent tarnishing of the outer layer. Accordingly, Applicants submit that the claimed invention is distinguishable from Kodama et al., and that this rejection is overcome.

Rejections under 35 USC §103:

Claims 1-23 were rejected as being unpatentable over U.S. Patent No. 5,916,695 to Fister et al. in view of U.S. Patent No. 5,028,492 to Guenin et al. Applicants respectfully traverse the rejection.

Guenin et al. is discussed above. Fister et al. discloses an electrical conductor having a copper base substrate coating with a tin base coating layer. According to Fister et al., to inhibit diffusion of copper from the substrate into the coating, a barrier layer is interposed between the substrate and the tin layer. The barrier layer contains 20-40% nickel and is preferably predominantly comprised of copper.

Applicants submit that neither Fister et al. nor Guenin et al., taken individually or in combination, disclose or suggest the present invention. Neither Fister et al. nor Gueinin et al. disclose or suggest a coated substrate having an antitarnish layer positioned between a substrate and an outer layer, and wherein the antitarnish layer is present in an amount effective to prevent tarnishing of the outer layer. Neither Fister et al. nor Guenin et al. further disclose a nonzero concentration gradient of antitarnish agent infused into the outer layer. Accordingly, Applicants submit that the claimed invention is not obvious in view of Fister et al. nor Gueinin et al., taken individually or in combination, and that this rejection is overcome.

Claims 13-18, and 21-23 were rejected as being unpatentable over U.S. Patent No. 5,028,492 to Guenin et al. Claims 3-5 and 16-18 were rejected as being unpatentable over U.S. Patent No. 5,759,379 to Cavallotti et al. For the reasons stated above,

Applicants submit that the presently claimed invention is not obvious over these references, and that this rejection is overcome.

Applicants now submit that the claims are in condition for allowance, and respectfully request reconsideration and issuance of a timely Notice of Allowance.

If the Examiner has any questions or feels that a discussion with Applicants' representative would expedite prosecution, the Examiner is invited and encouraged to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,

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APPENDIX I

CLAIM AMENDMENTS UNDER 37 CFR 1.121(c)(ii)

Claims 1, 2, 9, 13, 14, 19, 20, 21, and 22 are REWRITTEN as follows:

1. (Amended) A coated substrate, comprising:

an antitarnish layer deposited on a substrate [in an amount effective to prevent tarnishing of said coated substrate]; and

an outer layer deposited onto said antitarnish layer, said outer layer comprising tin or tin alloys having at least 50% by weight tin, and wherein said antitarnish layer is present in an amount effective to prevent tarnishing of said outer layer.

2. (Amended) The coated substrate of claim 1, wherein said antitarnish layer comprises an antitarnish agent selected from the group consisting of zinc, chromium, indium, phosphorous, manganese, boron, thallium, calcium, silver, gold, platinum, palladium, and combinations [or alloys] thereof.

9. (Amended) The coated substrate of claim 8, wherein said barrier layer comprises an element selected from the group consisting of nickel, tin, iron, cobalt, copper, manganese, and combinations [and alloys] thereof.

13. (Amended) A coated substrate comprising a coating on a substrate, said coating having a first surface and a second surface, said second surface positioned adjacent to said substrate, and comprising:

a metal layer comprising tin or tin alloys having at least 50% by weight tin; and

a nonzero concentration gradient of antitarnish agent diffused into said metal layer, said nonzero concentration gradient having the highest concentration of said antitarnish agent at said second surface, said antitarnish agent present in said coating in an amount effective to prevent tarnishing of said [coating] metal layer;

and wherein said coating has a thickness between 10 microinches and 1000 microinches.

14. (Amended) The coated substrate claim 13, wherein said [antitarnish layer comprises an] antitarnish agent is

selected from the group consisting of zinc, chromium, indium, phosphorous, manganese, boron, thallium, calcium, silver, gold, platinum, palladium, and combinations [or alloys] thereof.

19. (Amended) The coated substrate claim 13, further comprising a barrier layer disposed between said second surface and said substrate [and said antitarnish layer].

20. (Amended) The coated substrate claim 19, wherein said barrier layer comprises an element selected from the group consisting of nickel, tin, iron, cobalt, copper, manganese, and combinations [and alloys] thereof.

21. (Amended) The coated substrate of claim 13, wherein said [outer layer] coating further comprises a friction-reducing material selected from the group consisting of polyimide, polyamide, polytetrafluoroethylene, silicon carbide, aluminum oxide, tungsten carbide, molybdenum disulfide, and combinations thereof.

22. (Amended) The coated substrate of claim 13, wherein said coating [is in a heat treated condition and] has a coefficient of friction in the range of from 0.1 to 0. 3.

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